

Report of

Computational Acoustics Special Interest Group meeting

Held on 20th February 2018,

at the Macdonald Burlington Hotel, Birmingham

The first meeting of the Computational Acoustics group was a one-day meeting with technical presentations in the morning, and facilitated discussions in the afternoon. 25 people attended the meeting, including 9 from industry or the commercial sector. #CompAcoustics was created for Tweets at the meeting, and these were retweeted to @acoustics_ac_uk.

The programme of technical presentations (see programme in Appendix for details) covered a range of computational acoustics methods including Boundary Element, Finite Element, Finite Difference, Finite Volume, Flux Reconstruction, and Dynamic Energy Analysis. Each speaker presented an introduction to the method, the underpinning equations, and the principles and assumption for the solution, and showed some results of its use in particular applications. Speakers also identified certain advantages and disadvantages of the techniques, alongwith key challenges and areas needing further development.

The facilitated group discussions addressed three main topics, and the outcomes of the discussion are presented below.

Key Challenges

What are the *key technical challenges* in computational acoustics? e.g. industry needs, multi-length scale, facilities, benchmarking.

The top challenges identified were:

- Methods for mid-frequency domain ($kd \sim 1$)
- Benchmarking
- Metrics for accuracy
- Technology transfer: getting methods from development into use
- Methods for disparate energy scales (e.g. acoustics in turbulent flow)
- Scalability of solvers
- Multi-purpose versus bespoke code

Activities

What *activities* should the group be planning? What steps are needed to progress these? What should the activity look like in more detail? e.g. technical events, webinars, an exchange scheme, outreach.

The activities requested for the group were:

- Public engagement
- Exchange schemes
- Technical meetings
- Benchmarking
- Sandpit event

- Survey to identify key challenges in this domain
- Development of standards
- Specialist Webinars
- Web resources

Resources

What are the key resources that we need and how should we move this forward? e.g. Mapping expertise and facilities. Scoping activity. Web resources. What do we need to know?

The key resources and actions that were identified were

- mapping expertise
- collating information (challenges, benchmarks)
- developing web resources
- generating collaborations
- running a sandpit event
- write review articles
- support job adverts and career development
- tapping into industry support for proposals

Management team for the Group:

Dr Valerie Pinfield (Loughborough University): group lead

Prof Simon Chandler-Wilde (University of Reading)

Dr Jonathan Hargreaves (University of Salford)

Ms Amelia Gully (University of York) – Early Career Researcher, who volunteered at the meeting.

Further offers of support for organising activities of the Group were received from Dr Pierre Gelat, (UCL, benchmarking), Prof Gregor Tanner (Nottingham, sandpit event), Steve Fisher (Jaguar Landrover, sandpit event).

Appendix A: Programme of meeting

Computational Acoustics Special Interest Group

Tuesday 20th February 2018

Macdonald Burlington Hotel, Birmingham, B2 4JQ

Free to attend. To register: contact Dr Valerie Pinfield (v.pinfield@lboro.ac.uk)

Programme:

- 09.30 Welcome and Introduction
Dr Valerie Pinfield, Leader of Computational Acoustics Special Interest Group
- 09.45 Boundary element method
Dr David Hewett, University College London
- 10.15 Finite difference method for aeroacoustics
Dr Bidur Khanal, Cranfield University
- 10.45 Finite volume method and flux reconstruction methods
Dr Mark Allan, Zenotech
- 11.15 Refreshments
- 11.45 Ray-tracing for structure-borne sound using linear operators - the Dynamical Energy Analysis
Prof Gregor Tanner, University of Nottingham
- 12.15 Finite element method and coupled methods for acoustics
Dr James Gaffney, COMSOL
- 12.45 Finite element method for linear scattering problems
Dr Valerie Pinfield, Loughborough University
- 1.00 Lunch and networking
- 2.00 Structured discussions: activities of the Group
- 4.15 Concluding remarks

Organisers:

Dr Valerie Pinfield, Loughborough University, v.pinfield@lboro.ac.uk

Prof Simon Chandler-Wilde, Reading University, s.n.chandler-wilde@reading.ac.uk

Dr Jonathan Hargreaves, Salford University, J.A.Hargreaves@salford.ac.uk

Please also register as a member of the Acoustics Network and this Special Interest Group through the website www.acoustics.ac.uk. Note that the original group name (Numerical Methods) may still be appearing on the website.